8K

Testing the PET Computer

The PET Test includes a cassette tape containing four diagnostic programs and the diagnostic connector. Let's first look at these two.

The *program list* includes the ROM test, the memory poker, the data checker and screen alignment. They're recorded redundantly and, in the case of memory and data, for both the 4K and the 8K units. The exact sequence can be found below.

The diagnostic connectors, one connected to the keyboard connector and the other to the user port, enable you to conduct the diagnostic routine resident in the ROM.

You will now be able to check out:

- all RAM chips
- the parity of ROM
- the keyboard circuit
- the TV display logic
- the read/write of both cassette ports
- the user port
- the I.E.E.E. 488 port

Program List for Diagnostic Test Tape

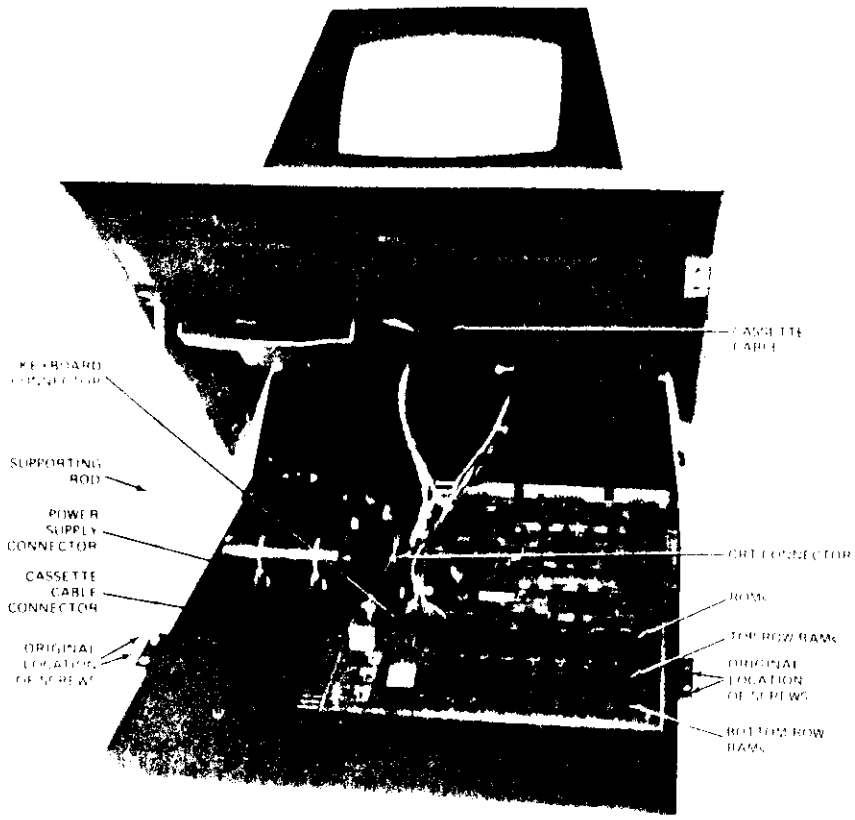
1. ROM Test
2. ROM Test
3. ROM Test
4. 4K Memory POKER
5. 4K Memory POKER
6. 8K Memory POKER
7. 8K Memory POKER
8. 4K Data Checker
9. 4K Data Checker
10. 8K Data Checker
11. 8K Data Checker
12. Screen Alignment
13. Screen Alignment

I. Diagnostic Routine — Using the Diagnostic Connectors

A. Opening the PET Computer.

1. Press the rocker switch to the "Off" position.
2. Remove the power cord from the wall socket to avoid possible electrical shock.

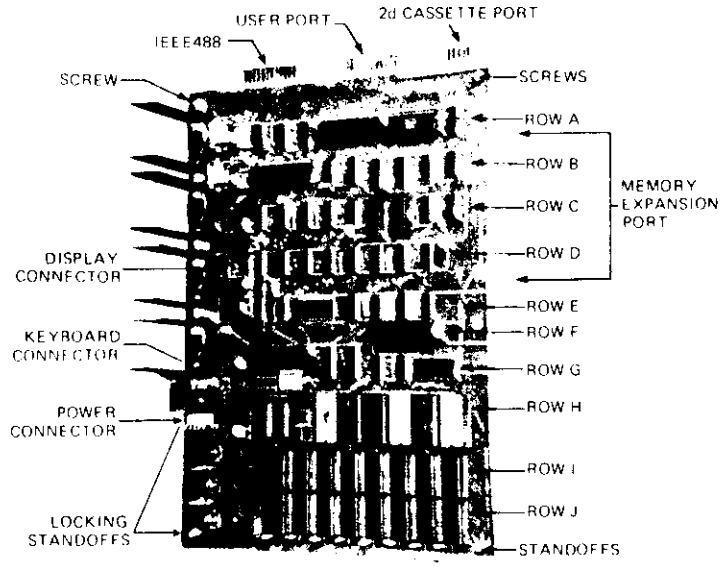
3. Remove the two screws located on each side of the unit under the lip of the cover.



4. Lift the cover slowly a few inches. When you locate the cable leading to the cassette, remove the connector at the main board. Then lift the cover all the way up and engage the supporting rod located on the left side of the cover.

B. The Diagnostic Connectors

1. Remove the keyboard cable from the connector on the main logic board.
2. Insert the proper diagnostic connector into this connector.
3. Insert the other connector into the user port. Make sure of power polarity.



ROW A CHARACTER GENERATOR ROM 6522 VIA
ROW B TIMING CHIPS AND 6520 PIA
ROW C BUFFERS AND TIMING
ROW D BUFFERS AND TIMING
ROW E MPU
ROW G 6520 PIA AND TIMING
ROW H ROMs
ROW I RAMs
ROW J RAMs

C. The Diagnostic Routine

1. Turn on the PET.
2. The routine will now clear the screen. (The red LED on the main board should not be on.)
3. The cursor should now begin to sweep across all locations on the TV screen.
4. When the cursor leaves the screen at the bottom right, the display will fill with a full character test pattern. Use this test pattern to check visually for all characters; make sure that no bits are flickering on the screen.
5. The red LED should now be lit indicating the main logic board has passed the diagnostic test.

D. Completing the Diagnostic Routine: Extended BASIC Test

1. Turn off the PET. Remove the keyboard diagnostic connector and reconnect the keyboard cable. Remove the diagnostic connector from the user port. Close the unit and turn the PET back on.
2. The TV display should clear and then display the following:

FOR 8K MODELS

```
***COMMODORE BASIC***
7167 BYTES FREE
READY.
■
```

FOR 4K MODELS

```
***COMMODORE BASIC***
3067 BYTES FREE
READY
■
```

E. Removing the Logic Board

In the event that the logic board needs to be replaced, please note that the board is secured by three (3) screws and three (3) locking standoffs.

1. Remove all connectors to the board.
2. Remove the three screws.
3. Unlock the stand-off while pulling the board up off the standoffs.

NOTE: The following series of four tests will be in conjunction with the diagnostic program tape.

II. The ROM Test

A. Procedure for Loading

1. Open the cassette drive cover and place the cassette in just as you would a normal audio cassette.
2. Type in LOAD, or hold down the [SHIFT] key and touch and release the [RUN/STOP] key. (Either way your screen should show **LOAD**.) If you typed in **LOAD**, now type in RUN.
3. Press the key labeled "PLAY" on the cassette unit.
4. Your screen should now show:

```
LOAD
PRESS PLAY ON TAPE #1
OK
SEARCHING
FOUND PROGRAM (program name)
LOADING
```

5. Let the program run until the PET is warmed up (approximately fifteen minutes).

B. Verification

This test will verify all ROM chips. If there is a failure, a number will appear to the right of the cursor. The number on the screen refers to the position of the defective ROM (1 to 7) which will always appear in row H. Now, shut off power, replace the defective ROM, and turn the power back on.

C. Repeat Test

In the event a ROM has proved to be defective, repeat the test. This will assure you that no other ROMs are defective. It's also a safeguard: a defective ROM can make the program invalid; repeating the test will overcome this.

To repeat the test, repeat steps 1, 2, 3, and 4 in Procedure A above. (Remember that there are *three* consecutive ROM Tests on your diagnostic program tape. Had there been only one, you would have to first rewind the cassette and start again).

III. The Memory Test (Memory Poker)

A. Procedure for Loading

1. Follow the general method for loading as outlined previously. But this time, type LOAD "8K MEMORY POKER" (or 4K Memory Poker, if you're testing a 4K). This will allow the PET to skip through ROM TESTS #2 and #3, and the 4K Memory Poker, if you're testing the 8K. See the program list on page 1. Then type in RUN.
2. Allow the program to run at least 1000 seconds (approximately seventeen minutes).

B. Locating Defective RAM

If a failure occurs, the location of the defective RAM will be displayed on the screen in this fashion (as an example):

```
13D2-H
```

Where the first character (1) is the row, the second (3) is the position in the row. Both are printed on a reverse field. The D refers to data and the next digit indicates the data bit. (The second data bit in this case.) The last character (H or L) refers to the failure condition (High or Low).

C. Replace the Defective RAM

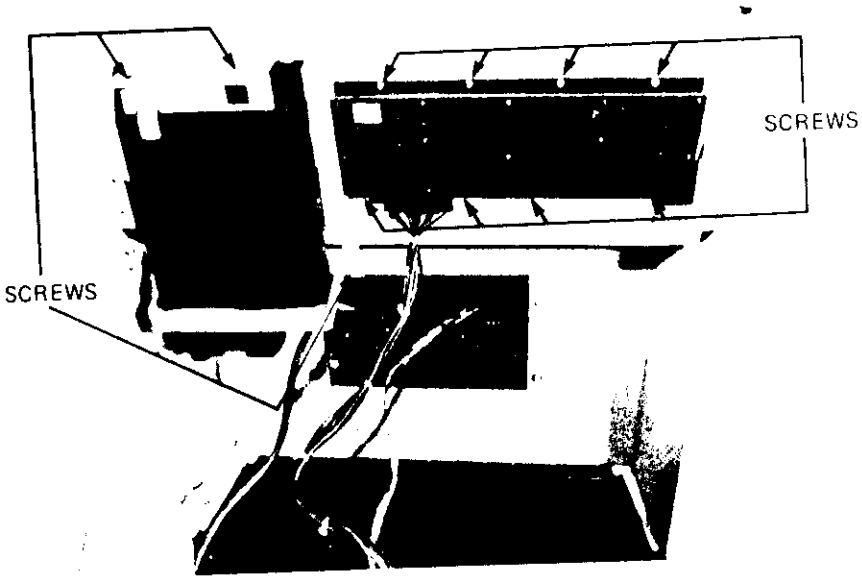
D. Repeat Test, following the same procedure as in II C.

IV. The Data Checker (Cassette Test)

A. Procedure for Loading and Testing

1. The cassette mechanism should be checked for proper mechanical operation. Insert a cassette in the player. Test rewind and fast forward functions. Test play and stop button. Listen for any loud rubbing or grinding noise. Finally, test the eject function of the cassette mechanism.

   Before you verify the read/write capability of the cassette player, follow the procedure on "Cleaning and Demagnetizing Tape Deck Head" as indicated in "An Introduction to Your PET" book.



2. Attach the second or external cassette drive to the port in the rear right corner of your PET.
3. Following the procedure outlined previously in II A, type in

   LOAD "8K DATA CHECKER"

   (or 4K, as the case may be).

4. Let program cycle and check for errors.
5. Remove cassette program, insert a rewound blank tape. Type

   SAVE "PET #" RETURN

   (The # may be any that you choose.) The PET should display

   PRESS PLAY AND RECORD ON TAPE #1.

   Hold REC (record) button down on cassette drive while engaging the PLAY button. The PET BASIC will save this program on the blank tape under the new name.

6. When cursor returns to the display, stop the cassette drive and rewind the tape.
7. Type

   VERIFY RETURN

B. Verification—First (Built-in) Cassette

1. The PET BASIC should find and verify the program just saved on Tape # 1. Check the name of the verifying program. It should be the name it was saved under. The "VERIFY" should finish with an OK.

   a. If the screen displays

   ? VERIFY ERROR

   there could be a tape or memory retention problem.

2. Type

   PEEK (630) ,ST RETURN

   Two numbers should appear in the display. The first number represents the amount of drop-out times 2 and should be less than, or equal to, 4. The second number represents the status word and should be zero.

   a. The cassette read/write capability has been verified with the external cassette application.

C. If First Cassette Malfunctions:

1. Test cassette drive by disconnecting male connector of cassette on logic board. Substitute a tested cassette drive.
2. To remove the cassette assembly entirely, remove cassette connector from main board, loosen the two screws on the rear bracket, and remove the two screws located in the front of the unit.

D. Testing Second (External) Cassette Drive)

1. Remove tape from built-in cassette drive and transfer to the external cassette drive.

2. Type

   VERIFY " ",2 [RETURN]

3. When the display reads

   PRESS PLAY ON TAPE #2

   do so.

4. Follow same verification procedure as B, above.

V. Screen Alignment

A. Procedure for Testing

1. Type

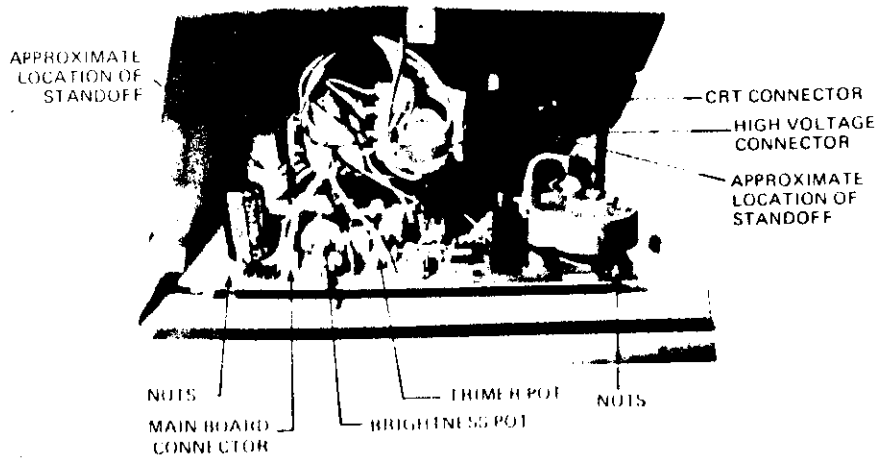
   LOAD "SCREEN ALIGNMENT"

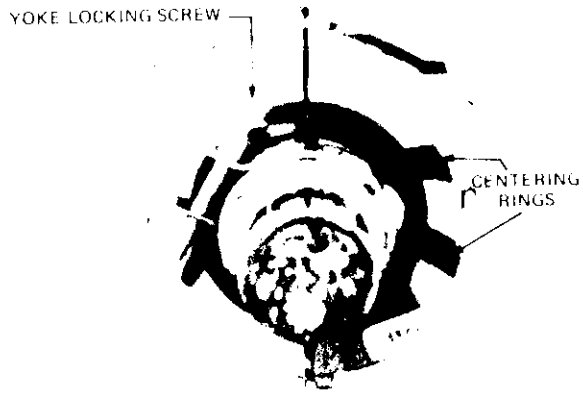
2. The GET command in BASIC will offer three choices in display: 1, 2, or 3.
   a. 1 is the checker board across the entire screen.
   b. 2 is a crisscross pattern across the entire screen . . . for alignment.
   c. 3 creates a pattern of @ signs and represents 0 in the binary memory code.

B. Observation and Correction

On the basis of the condition observed, as set forth below, this is what the correction should be:

1. Vertical size too large (can't see top or bottom lines).
   a. Correction: Located to the right and back of the display assembly is a white trimmer pot standing on end with a slot on it. Turn the slot clockwise or counterclockwise until you achieve the proper size.
2. Screen is slanted.
   a. Correction: Loosen the locking screw on the yoke assembly. Rotate the yoke clockwise or counterclockwise until you achieve proper alignment.
3. Screen not centered.
   a. Correction: The yoke assembly has 2 metal rings with taps located in the center of the yoke. By rotating one or both rings, move the picture in a circular pattern. Adjust until screen is centered.





You have now completed the diagnostic routines using the connectors and the cassette program. You've tested virtually everything, except the keyboard and the cassette mechanism.

VI. The Display Assembly

CAUTION: THE DISPLAY CIRCUIT GENERATES 10,000 VOLTS D.C. EXTREME CARE MUST BE USED.

On the assumption that the display is faulty, here's how to remove the assembly. We will not discuss how the *testing* of the assembly per se; the diagnostics routine should have given us all the needed information.

A. Unplug your PET from any electrical outlet.

B. Remove the three screws from the cover plate on the upper housing and lift off the plate.

C. Unplug the main board connector.

D. Discharge the CRT by grounding the high voltage connector: connect a clip lead from the brightness pot. lead to the shank of a thin bladed screwdriver (with a well-insulated handle). Then, with the blade of the screwdriver, reach beneath the plastic cover on the side of the tube.

E. Unplug the CRT connector by pulling it straight back from the CRT.

F. Turn the locking screw on the yoke until it is loose. Pull the yoke straight back off the picture tube.

G. Unplug the high voltage lead.

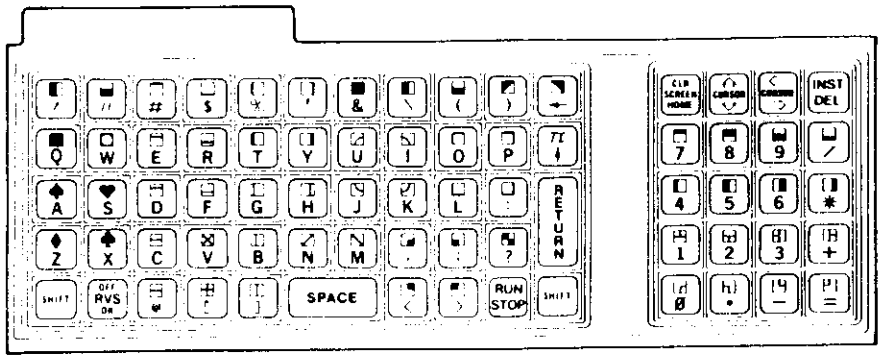
H. Remove the two nuts securing the display board.

I. Lift the display board up off the two plastic locking standoffs and remove the board from the housing.

VII. The Keyboard

A. Testing.

Verify all keys are operational and that each character on the keyboard corresponds to the display.



1. Plug in a working keyboard.

2. Type the following sequence of characters and verify that they appear on the screen:

```
! // # $ % ' & / ( ) ←
Q W E R T Y U I O P ↑
A S D F G H J K L :
Z X C V B N M , ; ?
@ [ ] < >
7 8 9 / 4 5 6 * 1 2 3 + 0 . – =
[SPACE] [RETURN]
```

PET should respond with

```
? SYNTAX ERROR
READY.
```

3. Type this line

? " [CLR HOME] AND [SHIFT] [CURSOR ↓] [CURSOR →] [OFF RVS] AAA [RETURN]

Screen should clear and show

```
AAA
READY.
```

B. Malfunctioning

1. Assuming there is a keyboard fault, replace the keyboard with one you're sure of.

   a. The keyboard is secured with eight screws. Remove these, then press firmly down on the keyboard until assembly comes loose.

2. If unit still malfunctions, assume the logic board is at fault.

   b. The board is secured by three screws and three locking standoffs. Remove all connectors to the board. Remove the three screws. Unlock the standoffs while pulling the board up off these standoffs.

VIII. Testing Upper and Lower Case

A. Type POKE 59409, 52

1. The TV display should go blank.

B. Reset the PET by turning power switch off then on.

C. Type

♦♦♦ZZZ

(*♦ is the shifted Z*)

(*Use cursor to go down and to the left*)

POKE 59468,14 RETURN

the row of characters should change to

zzzZZZ

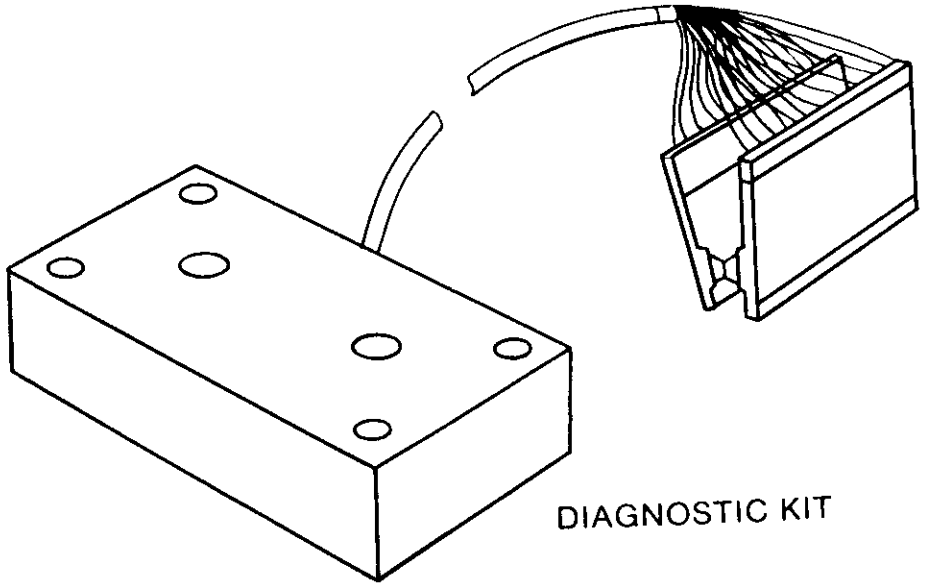
D. Now type

POKE 59468,12 RETURN

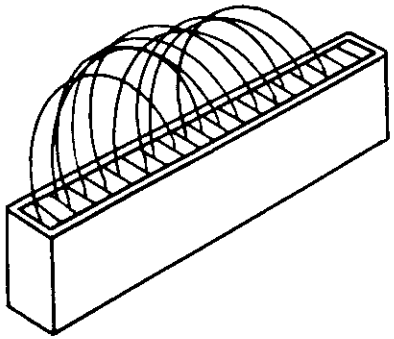
The row of characters should once again read

♦♦♦ZZZ

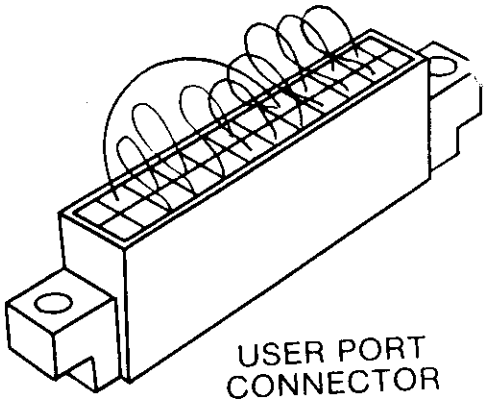
DIAGNOSTIC SET



DIAGNOSTIC KIT



KEYBOARD CONNECTOR



USER PORT CONNECTOR

Testing the PET Computer

The PET Test includes a cassette tape containing 5 diagnostic programs and the diagnostic Test set.

The program list includes:

1. Graphic ROM Test
2. Graphic ROM Test
3. BUS ROM Test
4. BUS ROM Test
5. DYN RAM Test
6. DYN RAM Test
7. Data Checker
8. Data Checker
9. Screen Alignment
10. Screen Alignment

The diagnostic test set contains: diagnostic connectors, one connected to the keyboard connector and the other to the user port, and one diagnostic kit.

I. Necessary Tools

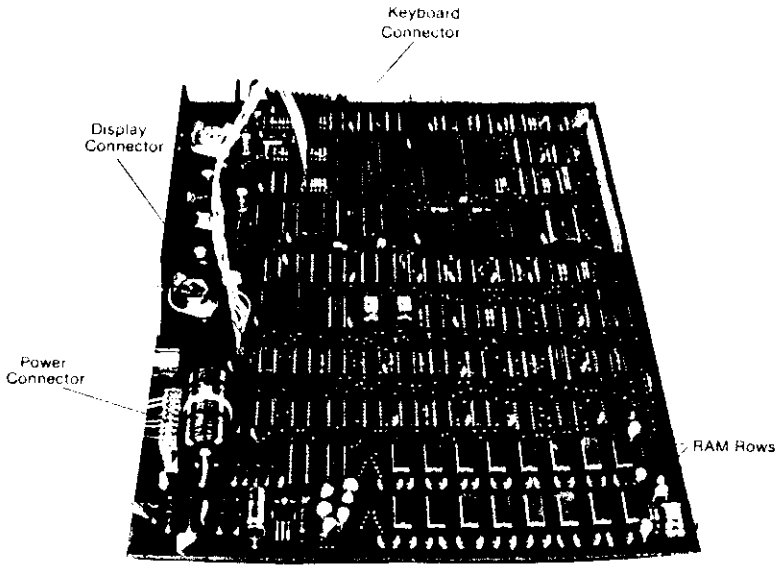
A. Cassette Recorder
B. Diagnostic Test Tape #2
C. Diagnostic Kit
D. Diagnostic Connectors

II. Diagnostic Routine Using the Diagnostic Kit

A. Opening the PET Computer.

1. Press the rocker switch to the "OFF" position.
2. Remove the power cord from the wall socket to avoid all possible electrical shock.

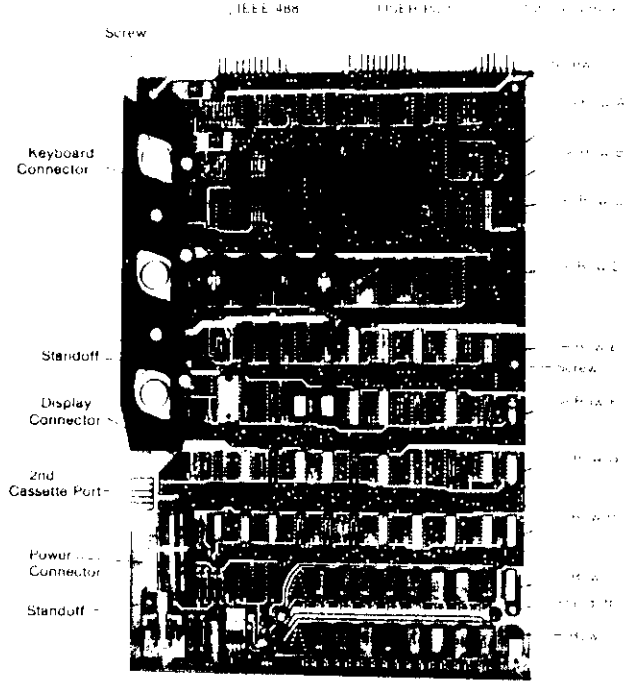
3. Remove the two screws located on each side of the unit under the lip of the cover.



4. Lift the cover slowly and engage the supporting rod located on the left side of the cover.

B. The Diagnostic Connectors

1. Remove the keyboard cable from the connector on the main logic board.
2. Insert the proper diagnostic connector into this connector.
3. Insert the other connector into the user port.
4. Attach Diagnostic clip to the 6502 microprocessor (The LED on the box will light if the clip is on properly.)



C. Test

The Diagnostic Fixture consists of a 40-pin clip, to which is attached a small box containing a 2716 EPROM, a 74LS138 gate chip, a RESET pushbutton, and an LED.

The test fixture is clipped onto the 6502 CPU. The keyboard and User Port Diagnostic Jumpers in place. Turn on power switch.

The test fixture LED will light, indicating that there is + volts on the board and that the test fixture is correctly clipped onto the 6502.

Upon pressing the RESET button, the 6502 will attempt to address the ROM in the FXXX address range; the fixture will force this address to be 9XXX, to execute the program in the test fixture ROM.

The operator will monitor the test results via message on the CRT, as described below.

D. Results:

1. As each test starts, it will be identified on the TV screen. If the PCB passes all tests the message "PASS CYCLE ØØØØØØ" will be displayed. Diagnostic Program will then loop through the tests.

2. If any failure occurs, it will be displayed on the TV screen, and chip failures will display the column and row on the logic PCB.

Additional Features:

1. Repeat Test
   a) Failure in RAM and ROM tests automatically repeat a test pattern on address and data lines.
   b) I/O test failures will toggle the bad I/O line.
2. Repeat all tests
   a) Automatic Repeat after "PASS CYCLE ØØØØØØ" message.

E. Software

The first three tests in the Diagnostic are executed solely from the ROM on the Diagnostic Test Fixture. Successful completion of the first test indicates that the 6502 can fetch and execute instructions and that, in general, the CPU's address data, and control busses are okay. This is indicated by the CRT display of the sign-on message. The Diagnostic Program will then proceed to the second test.

The second test also executes from the Diagnostic Test Fixture ROM. This is not a full test of the dynamic RAM but simply verifies that the RAM (Z page and stack) may be written and read, and that the program may proceed to the next test. If this is not successful, the program will stay in a loop, attempting to write and read the failing RAM address. The operator may then use the scope to check the RAM address, data, and control signal as required.

Upon successful completion of the first tests, the ROM will write the remaining tests from itself into dynamic RAM, and jump to the RAM to execute them. They will then proceed as described below:

TEST SEQUENCE
FOR DIAGNOSTIC CLIP

1.0 Test screen
2.0 Test Z-page
3.0 Test stack
4.0 Move diag. prgm.
5.0 Wait for clip to be removed
6.0 Checksum ROM 8D (EØØØ)
7.0 Check IRQ vector ROM 9D (FØØØ)
8.0 Count down before INIT
9.0 INIT all I/O, CLR screen
10.0 Time 60 Hz IRQ
11.0 Horz. Drive Test
12.0 Test Dyn RAM
13.0 Checksum all 4 ROMs (CØ-FØ)
14.0 Test keyboard
15.0 Test timers (5C-6522)
16.0 Test Cass #1 and Cass #2 IRQ's
17.0 Test IEEE-488 DIO BUS
18.0 Test IEEE-488 Control BUS
19.0 Blink Pass message and # of cycles check for loop switch.

1.0 Test Screen

a) Write pattern into screen. Read and test pattern.
b) Indicate defective TV RAM chip or address line.

2.0 Test Z-Page

a) Zero stack page for later test
b) Fill Z-page with pattern and test the pattern
c) Indicate defective I.C. or address line.

3.0 Test Stack

a) Check stack still zero, indicate any address failure
b) Fill stack with pattern and test the pattern
c) Indicate defective I.C. or address line

4.0 Move Diagnostic Program

a) Copy 8 pages from Boot ROM into Dyn RAM
b) Test moved copy
c) Indicate defective I.C. or address line.

5.0 Wait for Clip to be Removed

a) Blink "Remove Clip" message
b) Check Reset vector for clip removed
c) Debounce clip removal.
d) Determine Dyn Ram size (16K or 32K)

6.0 Checksum ROM 8D ($E000-$E7FF)

a) Perform 3 byte checksum of ROM of E000 to E7FF
b) Indicate defective I.C.

7.0 Check IRQ Vector ROM 9D (FØØØ)

a) Test locations $FFFE and $FFFF for correct data.
b) Indicate defective I.C.

8.0 Count down before INIT

a) Time delay for operator to read screen.

9.0 INIT all I/O

a) Call INIT routine in operating system.
b) Test video for full blank screen.
c) Test 60 Hz IRQ

10.0 Time 60 Hz IRQ

a) Compare 1 60 Hz IRQ to register counters.

11.0 Horz. Drive Test

a) Window low and hi side of Horz. Drive signal.

12.0 Test Dynamic RAM

a) Fill all Dynamic RAM with test pattern
b) Test pattern
c) Indicate defective I.C. or address line

13.0 Checksum all ROMs

a) Perform 3 byte checksum on all 4 ROMs
b) Indicate defective I.C.

14.0 Test Keyboard

a) Drive each column, read each row
b) Toggle defective line

15.0 Test Timers

a) Compare 6522 timers to reg counters
b) Cause IRQ's from timers.

16.0 Test Cassettes

a) Cause IRQ for each cassette.
b) Check for correct IRQ

17.0 Test IEEE-488 DIO Bus

a) Write all 256 combinations out IEEE-488 DIO Bus
b) Read verify each
c) Toggle defective lines

18.0 Test IEEE-488 Control Bus

a) Toggle each line separately
b) Read verify each
c) Toggle defective line.

19.0 Blink PASS MESSAGE

a) Blink Message
b) Test PIN-E USER Port for Loop Diag. Function

III. ROM Test for Graphic 16 & 32K, Business 16 & 32K

A. Function

The ROM Test is a machine language program which loads into addresses from $0400 to $04AF. The program exits BASIC with a SYS(1039) or address $040F.

The program performs a 3 byte checksum on each ROM and compares the checksum to a known value. An incorrect checksum will cause the program to display the column number of the bad ROM on the screen. All ROMs are located in ROW D.

The ROM test is a continuous test. The top left square of the screen winks every complete pass to indicate the program is running.

B. Connect the Cassette Recorder into the connector located on the rear, left hand corner. (Opposite ON/OFF switch)

C. Press STOP/EJECT key on the Cassette Recorder.

D. Insert "Diagnostic Test Tape #2" Tape.

E. Type in LOAD "GRAPHIC ROM TEST" [RETURN] for a Graphic PET or type in LOAD "BUS ROM TEST" [RETURN].

F. Press the key labelled "PLAY" on the cassette unit.

G. Your screen should now display:

```
LOAD "GRAPHIC ROM TEST"
PRESS PLAY ON TAPE #1
OK
SEARCHING FOR (Program Name)
FOUND (Program Name)
LOADING
```

or


```
LOAD "BUS ROM TEST"
PRESS PLAY ON TAPE #1
OK
SEARCHING FOR (Program Name)
FOUND (Program Name)
LOADING
```

H. When the cursor returns on the Display, type RUN [RETURN].

I. Let the program run until the PET is warmed up (approximately fifteen (15) minutes.

J. Verification

The Test will verify all ROM chips. If there is a failure, a number will appear to the right of the cursor. The number on screen refers to the position of the defective ROM (6 to 9) and will always appear in row D. Now shut off power, replace the defective ROM, and turn the power back on.

K. Repeat Test

In the event a ROM has proved to be defective, repeat the test. This will assure you that no other ROMs are defective. It's also a safeguard: a defective ROM can make the program invalid; repeating the test will overcome this.

IV. Memory Test for 16 & 32K PETS

A. Function:

The RAM Test initially loads into memory location $0400 to $059B. When the program is executed, it copies Page 4 to Page 0 and begins running the memory test from page 0.

The first part of the RAM Test program is a single BASIC line. The line performs a SYS 1280 and allows the program to leave BASIC and start executing the machine language program at location $0500.

The first section of the program is run out of page 5. It clears the screen and writes two messages on the screen.

1. "16K DYNAMIC PET RAM TEST"
2. "00001 CYCLES 00000 SECONDS"

The next section determines the size of the memory by testing a location in the upper 16K of memory. If the location tests good, the program is configured for 32K. If the location tests bad, the program is configured for 16K.

The final operation of the startup routines of the test is to copy page 4 down into page 0 and transfer control to the program located in page 0.

The page 0 program writes a descending pattern up through memory from page 1 to the top of good memory. Next the program waits the number of seconds displayed on the screen. After the waiting period, the descending pattern is tested for errors. The pattern will detect address problems and bit problems.

After the descending pattern is tested, the same memory is written with an ascending pattern. The pattern is configured to turn every bit which was a zero to a one and every bit which was a one to a zero. This is the bit error test.

If an error occurs the bad bits are saved. These bits are used to generate a column number on the screen for the bad chip. The upper address byte of the bad location is used to generate the row letter on the screen.

The number of cycles on the screen is incremented after each pass through memory. The cycle number determines the number of seconds wait before a memory test. The passes slow down to test the holding or latency of the dynamic RAM.

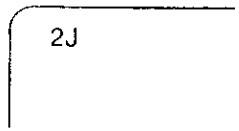
The only page **not** tested by the program is **Page 0**. Page 0 is tested indirectly by the RAM test residing in that location. This could indicate a problem in Page 0 memory by the RAM test program locking up or displaying strange messages on the screen.

B. Procedure for Loading

1. Follow the general method for loading as outlined previously. But this time, type LOAD "DYN RAM TEST". This will allow the PET to skip through the Graphic ROM tests. After the program has loaded type RUN RETURN
2. Allow the program to run at least 200 cycles.

C. Locating Defective RAM

If a failure occurs, the location of the defective RAM will be displayed on the screen in this fashion.



where the first character (2) is the column, the second (J) is the row. Both are printed on a reverse field.

NOTE: The RAM test has been designed to check both Rows of RAM. In the event you have only one row of RAM, the test will display the correct column of the defective RAM.

D. Replace the defective RAM.

E. Repeat Test, following the same procedures as in IIIC to III I.

V. The Data Checker (Cassette Test)

A. Procedure for Loading & Testing

1. The cassette mechanism should be checked for proper mechanical operation. Insert a cassette in the player. Test rewind and fast forward functions. Test play & stop button. Listen for any loud rubbing or grinding noise. Finally, test the eject function of the cassette-mechanism.

   Before you verify the read/write capability of the cassette player, follow the procedure on "Clearing and Demagnetizing Tape Deck Head" as indicated in Step VI and VII.

2. Following the procedure outlined previously, type in

   LOAD "DATA CHECKER".

3. Let program cycle and check for errors.

4. Remove cassette program, insert a rewound blank tape. type

   SAVE "PET # RETURN

   (The #may be any that you choose) the PET should display

   ```
   Press PLAY AND RECORD ON TAPE #1
   ```

   Hold REC (Record) button down on cassette drive while engaging the Play button. The PET BASIC will save this program on the blank tape under the new name.

5. When the cursor returns to the display, stop the cassette drive and rewind the tape.

6. Type

   VERIFY RETURN

B. Verification

1. The PET BASIC should find and verify the program just saved on tape. Check the name of the verifying program. It should be the name it was saved under. The "VERIFY" should finish with an OK.

   a. If the screen displays

   ```
   ? VERIFY ERROR
   ```

   there could be a tape or memory retention problem

2. Type

   ? PEEK (192), ST RETURN

   Two numbers should appear in the display. The first number represents the amount of drop-out times 2 and should be less than, or equal to, 28. The second number represents the status word and should be zero.

C. If Cassette Malfunctions:

1. Test cassette drive by disconnecting female connector from logic board. Substitute a tested cassette drive.

2. Replace cassette anologe with cassette field retrofit kit (P/N 320207).

VI. Cleaning your PET

With power switch in "OFF" position, gently wipe keytops with a slightly damp cloth. Do not flood with water.

Use any of the available lens-cleaner sprays to clean the video screen. Spray screen lightly, and dry with a soft, non-linting cloth or tissue.

Wipe the cabinet with a soaped, well-wrung sponge. Do not use any commercial abrasive cleaners. Rinse by wiping with clean, slightly damp sponge or soft cloth. Do not immerse in water.

Clean the recorder unit inside by touching dust particles with slightly damp cloth of sponge. Do not wipe surface ... cloth will snag on metal or plastic parts and may cause breakage. (See next section for more detailed instructions.)

The outside of the recorder unit may be cleaned in the same manner as the keytops.

VII. Cleaning and demagnetizing your tape deck head

To be performed every 50-100 hours of tape running time or when cassette unit fails to read tapes reliably.

You'll need the following tools and materials:

1) Tape head cleaner. ("NORTRONICS" Brand is recommended.) Do **not** use Tricloroethane or any other plastic or rubber solvent. Alcohol may be used in an emergency. but is not recommended for long term use.
2) Cotton Swabs. "Johnson & Johnson" Brand is recommended; the cotton seems to stick to the end of the swab better.
3) Tape Head Demagnetizer: "NORTRONICS," "HAND-DE-MAG" and "ROBINS" brands are recommended. Unit must have protective plastic or rubber covering on pole piece so as not to scratch delicate head gap.

How to Proceed:

1) Turn Off PET.
2) Press PLAY on tape deck to make heads available
3) Use tape head cleaner and one side of a cotton swab to clean surfaces of RECORD/PLAY (R/P) and erase head. (See Figure 7.)

   Scrub gently, noting if there is any build-up of tape oxide particles on or around head gap of the R/P head. If so, this is sufficient reason for unreliable performance.

   Also clean pinch roller and other tape bearing surfaces if tape head cleaner is suitable for this purpose. (Check label.)
4) Plug in demagnetizer and activate it while it is at least one foot away from cassette heads.
5) Slowly move demagnetier up to R/P head and around on head surface. Rate of motion should be approximately one inch per second during this time.
6) Slowly move demganetizer to erase head and then to all other ferrous metal surfaces which come into proximity with the tape.
7) Now slowly move demagnetizer away from heads and do not de-activate field until demagnetizer is at least two feet away from heads.

Tape head cleaning and demagnetizer procedure is now complete. Inspect R/P head surface for wear. If tape has worn a groove on head surface more than a couple of tape thicknesses deep and program reading performance is still poor, then replacement of tape head is indicated. (This usually occurs after three thousand or more hours of tape running time.)

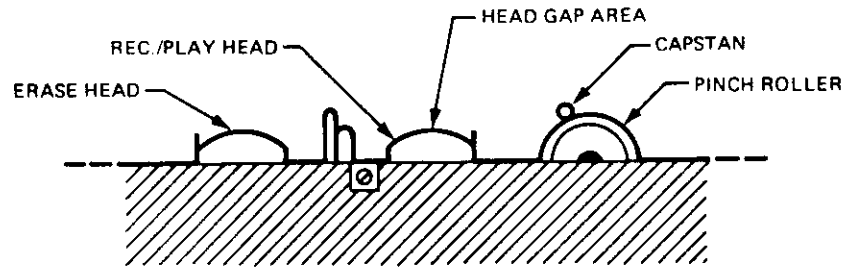


Figure 6. Cassette deck head area

VIII. Screen Alignment

A. Procedure for Testing

1. Type

   LOAD "SCREEN ALIGNMENT"

2. The GET command in BASIC will offer three choices in display: 1, 2, or 3.

   a. 1 is the checker board across the entire screen.
   b. 2 is the crisscross pattern across the entire screen ... for alignment.

   c. 3 creates a pattern of@ signs and represents 0 in the binary memory code.

B. Observation and Correction

On the basis of the condition observed, as set forth below, this is what the correction should be:

1. Vertical size too large (can't see top or bottom lines).

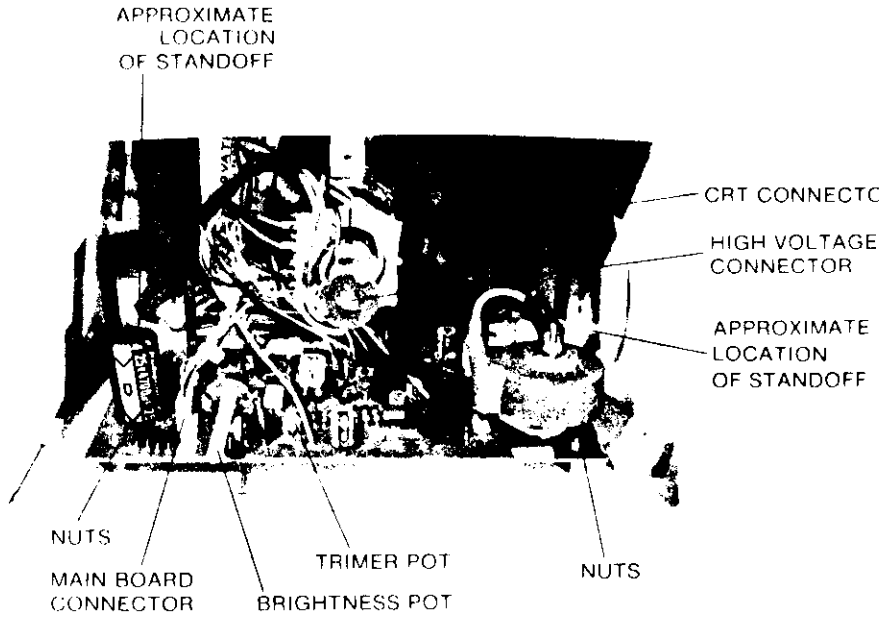
   a. Correction: Located to the right and back of the display assembly is a white trimmer pot standing on end with a slot on it. Turn the slot clockwise or counterclockwise until you achieve the proper size.

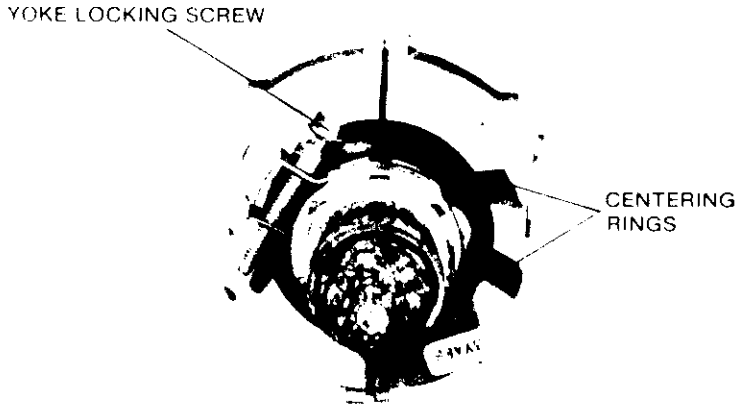
2. Screen is slanted:

   a. Correction: Loosen the locking screw on the yoke assembly. Rotate the yoke clockwise or counterclockwise until you achieve proper alignment.

3. Screen not centered.

   a. Correction: The yoke assembly has 2 metal rings with taps located in the center of the yoke. By rotating one or both rings, move the picture in a circular pattern. Adjust until screen is centered.





You have now completed the diagnostic routines using the connecto and the cassette program. You've tested virtually everything, exce the keyboard and the cassette mechanism.

IX. The Display Assembly

CAUTION: THE DISPLAY CIRCUIT GENERATES 10,000 VOLTS D.C EXTREME CARE MUST BE USED.

On the assumption that the display is faulty, here's how to remove the assembly. We will not discuss how the *testing* of the assembly per se; the diagnostics routine should have given us all the needed information.

A. Unplug your PET from any electrical outlet.

B. Remove the three screws from the cover plate on the upper housing and lift off the plate.

C. Unplug the main board connector.

D. Discharge the CRT by grounding the high voltage connector; connect a clip lead from the brightness pot. lead to the shank of a thin bladed screwdriver (with a well-insulated handle). Then, with the blade of the screwdriver, reach beneath the plastic cover on the side of the tube.

E. Unplug the CRT connector by pulling it straight back from the CRT.

F. Turn the locking screw on the yoke until it is loose. Pull the yoke straight back off the picture tube.

G. Unplug the high voltage lead.

H. Remove the two nuts securing the display board.

I. Lift the display board up off the two plastic locking standoffs and remove the board from the housing.

X. The Keyboard

A. Testing.

Verify all keys are operational and that each character on the keyboard corresponds to the display.

1. Plug in a working keyboard.
2. Type the following sequence of characters and verify that they appear on the screen:

```
!//#$%'&/()
QWERTYUIOP
ASDFGHJKL:
@()
789 /456 * 123 .-
```
SPACE RETURN

PET should respond with

```
?SYNTAX ERROR
READY.
```

3. Type this line

? " CLR HOME AND SHIFT CURSOR↓ CURSOR→
OFF RVS AAA RETURN

Screen should clear and show

```
AAA
READY.
```

B. Malfunctioning

1. Assuming there is a keyboard fault, replace the keyboard with one your're sure of.
   a. The keyboard is secured with eight screws. Remove these, then press firmly down on the keyboard until assembly comes loose.

2. If unit still malfunctions, assume the logic board is at fault.

   b. The board is secured by three screws and three locking standoffs. Remove all connectors to the board. Remove the three screws. Unlock the standoffs while pulling the board up off these standoffs.

XI. Testing Upper and Lower Case

A. Type POKE 59409,52

1. The TV display should go blank.

B. Reset the PET by turning power switch off then on.

C. Type

◇◇◇ZZZ
(◇ is the shifted Z)

(Use cursor to go down and to the left)

POKE 59468,14 RETURN

the row of characters hould change to

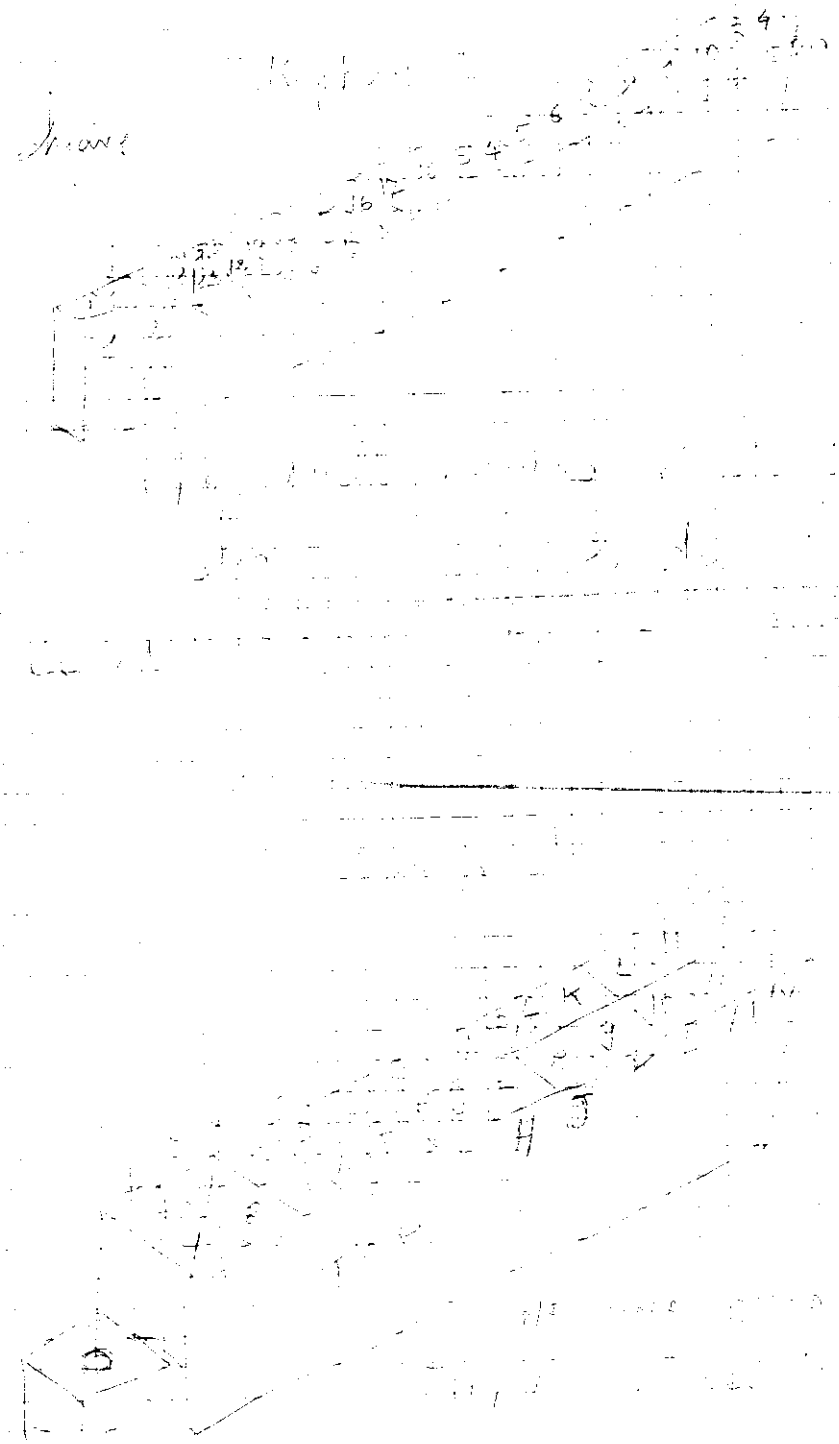
ZZZzzz

D. Now type

POKE 59468,12 RETURN

The row of characters should once again read

◇◇◇ZZZ



ERRATA
Testing The PET Computer

Page 1, Paragraph 5 should read:

1. ROM Test
2. ROM Test
3. ROM Test
4. 4K Memory POKer
5. 4K Memory POKer
6. 8K Memory POKer
7. 8K Memory POKer
8. 4K Data Checker
9. 4K Data Checker
10. 8K Data Checker
11. 8K Data Checker
12. Screen Alignment
13. Screen Alignment
14. 019 ROM Test
15. 019 ROM Test

Page 7, Item B2 should read:

Type

? PEEK(630) , ST [RETURN]

Page 11, Item 3. should read:

Type this line:

? " [SHIFT] AND [CLR HOME] [CURSOR ↓] [CURSOR →] [OFF RVS] AAA [RETURN]

Page 5, should be added to Item 3B:

When testing with 2114 RAMs

The position in the rows will be reversed, if the screen shows 13D2-H then the defective RAM is in position I6 and not in position I3.

Page 4 II, 5:

NOTE: If test shows ROM III defective, you are probably not using the correct ROM Test. Load 019 ROM Test in and note if ROM III shows defective again.